Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:

Pacific Reef Assessment and Monitoring Program: Assessing and Monitoring Cryptic Reef Diversity of Colonizing Marine Invertebrates using Autonomous Reef Monitoring Structures (ARMS) Deployed at Coral Reef Sites across the U.S. Pacific from 2008 to 2012

1.2. Summary description of the data:

To support a long-term program for sustainable management and conservation of coral reef ecosystems, from 2008, Autonomous Reef Monitoring Structures (ARMS) have been deployed and/or recovered across the U.S. on Pacific Reef Assessment and Monitoring Program (Pacific RAMP) cruises conducted at two to three year intervals by the Coral Reef Ecosystem Program (CREP) at the NOAA Pacific Islands Fisheries Science Center (PIFSC).

CREP partnered with other scientists from the Census of Marine Life (CoML) Census of Coral Reef Ecosystems (CReefs) to develop Autonomous Reef Monitoring Structures (ARMS). ARMS mimic the complexity of coral reefs to attract/collect colonizing invertebrates and provide a systematic, consistent, and comparable method to monitor cryptic reef diversity.

The key innovation of this method is that ARMS sample biodiversity over precisely the same surface area in the exact same manner. Thus, the use of ARMS is a systematic, consistent, and comparable method for monitoring the cryptobiota community overtime.

At specific reef sites, divers enter the water and deploy and/or recover the ARMS unit. Each unit consists of 23 cm x 23 cm gray, type 1 PVC plates stacked in alternating series of 4 open and 4 obstructed layers and attached to a base plate of 35 cm x 45 cm which is affixed to the reef. They are designed to mimic the structural complexity of a reef and attract colonizing invertebrates.

Upon recovery, the ARMS unit is encapsulated, brought to the surface, and disassembled and processed onboard the research ship. Disassembled plates are photographed to document recruited sessile organisms and scraped clean and preserved in 95% ethanol for future DNA processing. Recruited motile organisms are sieved into 3 size fractions: 2

mm, 500 um, and 100 um. The 500 um and 100 um fraction is bulked and preserved in 95% ethanol for future DNA processing. The 2 mm fraction is sorted into morphospecies.

1.3. Is this a one-time data collection, or an ongoing series of measurements?
One-time data collection

1.4. Actual or planned temporal coverage of the data:
2009-04-05 to 2011-05-08, 2008-02-24 to 2010-03-16, 2010-02-17 to 2012-04-26, 2008-09-14 to 2010-10-31, 2009-03-23 to 2011-03-26, 2008-02-06 to 2010-04-17, 2010-01-26 to 2012-05-18

1.5. Actual or planned geographic coverage of the data:
W: 144.6259167, E: 145.79122, N: 20.02963, S: 13.30528
Mariana Archipelago

W: -171.092233, E: -168.13792, N: -11.050833, S: -14.559317
American Samoa

W: -159.729133, E: -155.6884, N: 22.1669, S: 18.939
Main Hawaiian Islands

W: -178.378433, E: -166.135383, N: 28.418667, S: 23.627917
Northwestern Hawaiian Islands

W: 166.60383, E: 166.65115, N: 19.31013, S: 19.27116
Wake Atoll

W: -176.623989, E: -159.99086, N: 16.76325, S: -0.3818
Pacific Remote Island Areas, excluding Wake Atoll

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
Table (digital)

1.7. Data collection method(s):
(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)
Instrument: Not applicable
Platform: Not applicable
Physical Collection / Fishing Gear: Autonomous Reef Monitoring Structures (ARMS)

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:
Annette M DesRochers

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:
annette.desrochers@noaa.gov

2.5. Phone number:
(808)725-5461

3. Responsible Party for Data Management
Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:
Molly A Timmers

3.2. Title:
Data Steward

4. Resources
Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?
Yes

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):
Unknown

5. Data Lineage and Quality
NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible
(describe or provide URL of description):
Lineage Statement:
The analysis of Autonomous Reef Monitoring Structures (ARMS) is a two-part process. First, all of the invertebrates are counted. Second, the plates are scrapped with the contents passing through several different sized filters. All of the data is recorded in an MS Access database.

Process Steps:

- ARMS Deployment - The ARMS platform consists of 23 cm x 23 cm grey, type 1 PVC plates stacked in alternating series of 4 open and 4 obstructed layers and attached to a base plate of 35 cm x 45 cm which is affixed to the reef. They are affixed to the sea floor with either four stainless steel stakes or weights and zip ties and are typically deployed on mid-depth (10-15 meters) forereef habitats in replicate sets of three. Each ARMS unit is typically separated by 2-5 meters. A GPS waypoint of the site is obtained by swimming over the site to get a point directly above the ARMS unit. The ARMS site and ARMS units are photo documented; pictures of the surrounding habitat as well as the deployed ARMS are captured. Close-up images of the dominant benthic cover around the ARMS units are captured. ARMS remain on the bottom for a set period of time during which they become colonized with marine organisms. The soak time varies by unit model. Please see the data to determine how long a particular unit was underwater.
- ARMS Recovery and Processing - Photo documentation occurs of the ARMS and recovery site before the ARMS units are removed off of the benthos. The ARMS unit is detached from the substrate, encapsulated, brought to the surface, and disassembled and processed onboard the research ship. Disassembled plates are photographed to document recruited sessile organisms. The plates are rinsed lightly in a container to remove sand particles thereby providing a cleaner surface for imaging the sessile organisms on the plates. Each plate is placed in a shallow tray containing seawater to be photographed. An initial photo of the plate is obtained along with a close up image of each quarter of the plate, the center, and of anything of interest. Photos are obtained of the top and bottom of each plate in the unit. Images are used for analyses of sessile recruitment and composition. When all of the plate layers in the ARMS unit have been photographed and set aside (in seawater), the seawater from the disassembly tub, photo tray, and rinse bucket is sieved through adjoining 2 mm and 500 um sieve pans and an attachable 100 um mesh hand net. Material collected in the 500 um sieve and 100 um net are bulk preserved into two separate jars. Jars are filled with EtOH and labeled accordingly. The preserved 500 and 100 um sample fractions undergo mass sequencing techniques. The > 2 mm size fraction can either be bulked preserved, like the 500 and 100 um fractions, with the understanding that they will be sorted at a later date or can be sorted at the time of processing into morphospecies. Sorting the > 2 mm size fraction is more efficient immediately after processing because the organisms are alive, intact, and colorful. Ethanol, as a preservative, fades away specimen coloration, can separate annelid segments and can detach crustacean limbs when bulk preserved. Immediate processing of the > 2 mm size fraction also provides you with the opportunity to photograph the specimens for vouchering. When photographing specimens, the first image has the unique specimen label in the image. Subsequent images may be taken without the label for finer details. When images and identifications are complete, the specimen(s) are preserved in ethanol. All plates from an individual ARMS unit are scrapped en masse. Once all plates have been scraped, all the scrapings are transferred into a blender (Brevill; BBL600XL). The scrapings are blended for 45-60 seconds on maximum power until

sample is homogenized. The sample is then transferred from the blender to a 40 um net. The sample in the net is rinsed with filtered (< 40 um) seawater until all discharge from net is clear (takes ~2 gal). Four ~10 ml samples are preserved in 50 ml falcon tubes with DMSO or 95% EtOH, secure lid and shake. The remaining sample is stored in a sterile whirlpak at -20C. Between the processing of each ARMS unit the blender is rinsed in fresh water to remove any remaining homogenate. The blender is then placed in a 10% bleach solution for 15 minutes. Finally all parts thoroughly rinsed with DI water if available or fresh water. All recovered ARMS units are processed to the above step. When possible, ARMS samples are analyzed molecularly and taxonomically. Genetic analysis of ARMS samples using 454 Illumina mass sequencing techniques are currently under development through partnerships with the Smithsonian, San Diego State University, Moss Landing Marine Laboratories, and the Hawaii Institute of Marine Biology.

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):
The data entered in the MS Access database is quality controlled following data entry.

6. Data Documentation
The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?
No

6.1.1. If metadata are non-existent or non-compliant, please explain:
Missing/invalid information:
- 7.2. Name of organization of facility providing data access
- 7.2.1. If data hosting service is needed, please indicate

6.2. Name of organization or facility providing metadata hosting:
NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:
https://www.fisheries.noaa.gov/inport/item/36038

6.4. Process for producing and maintaining metadata
(describe or provide URL of description):
Metadata produced and maintained in accordance with the NOAA Data Documentation

Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

Yes

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:

http://accession.nodc.noaa.gov/0162469

7.3. Data access methods or services offered:

Data can be accessed online via the NOAA National Centers for Environmental Information (NCEI) Ocean Archive.

7.4. Approximate delay between data collection and dissemination:

Unknown

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:

(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To

Be Determined, Unable to Archive, or No Archiving Intended)

NCEI-MD

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):

Pacific Islands Fisheries Science Center - Honolulu, HI

NOAA IRC

8.3. Approximate delay between data collection and submission to an archive facility:

Unknown

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

The MS Access database is stored on the PIFSC network and regularly backed up by ITS.

9. Additional Line Office or Staff Office Questions

Line and Staff Offices may extend this template by inserting additional questions in this section.